# Magnetism and Superconductivity in Ruthenocuprates and Ruthenates. New Pathways to Novel Materials.

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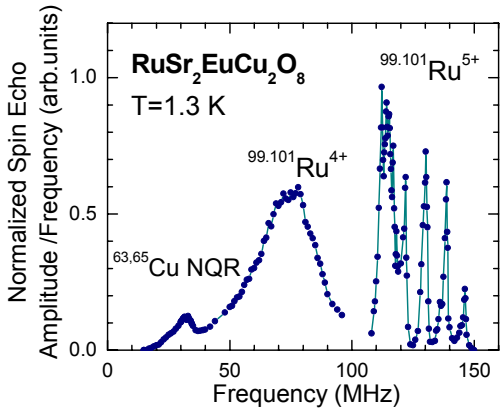
## *Study of magnetic correlations in $Ru_{1-x}Sr_2RECu_{2+x}O_{8-z}$ and $Ru_{1-x}Sr_2RE_{2-y}Ce_yCu_{2+x}O_{10-z}$ superconductors*




*In collaboration with J. Budnick et al – University of Connecticut*

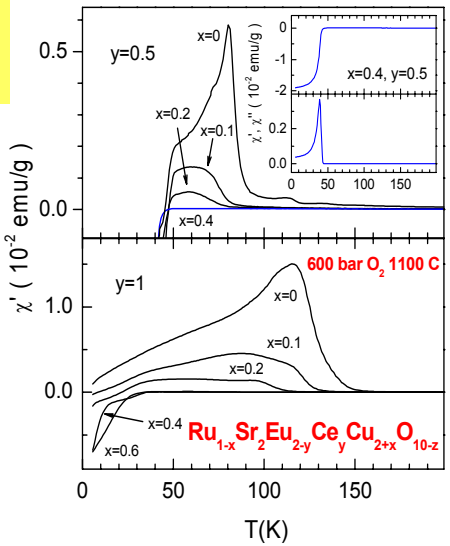
Local-probe nuclear magnetic resonance for magnetic superconductor $RuSr_2RECu_2O_8$ shows that the easy axis of magnetization for Ru spins is parallel to the $CuO_2$ planes – in disagreement with the G-type structure derived from the average-structure diffraction methods -

research in progress.

***Focus on the nanoscale coexistence of super-conductivity and magnetism***

*In collaboration with I. Felner et al - Hebrew Univ. of Jeruzalem*

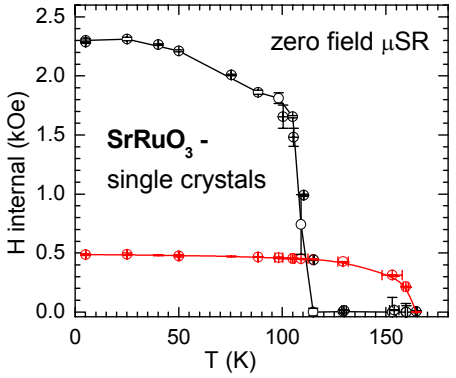
The Cu for Ru doping gradually diminishes the magnetic response in the normal state of the $Ru_{1-x}Sr_2Eu_{2-y}Ce_yCu_{2+x}O_{10}$ - the new superconducting phases have been found and are currently investigated.




## *Study of cation nonstoichiometry effects and magnetism in metallic ferromagnet $SrRuO_3$*

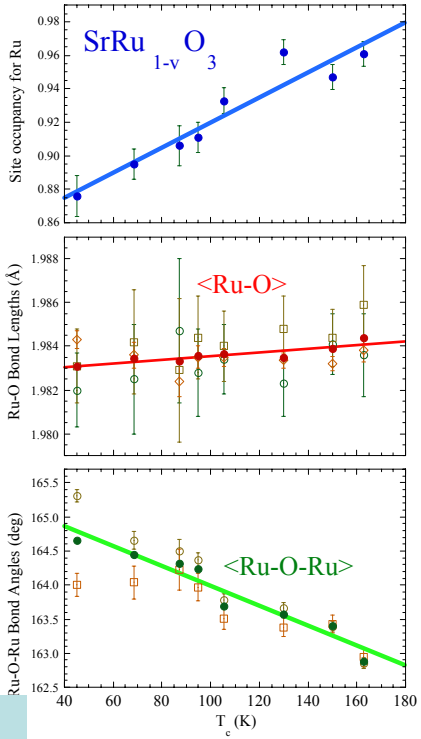
$SrRuO_3$, known as a highly correlated, narrow-band metallic ferromagnet with a robust $T_C \approx 160$ K, has been *intensively studied for possible application* as an electrode material in microelectronic circuits.

**YEAR 2**




*μSR spectroscopy – P.W. Klamut et al, PSI, Switzerland*

Zero field muon spin rotation spectroscopy reveals two component character of the local field with rapid change occurring at 110K.




*Neutron diffraction – B. Dabrowski et al, IPNS ANL*

We have shown that high-pressure oxygen annealing produces $SrRu_{1-v}O_3$ with randomly distributed vacancies on the Ru-sites. An increased amount of Ru vacancies rapidly suppresses $T_C$ but leads to minimal structural changes such as an increase of lattice parameters, decrease of the bond lengths, and increase of the bond angles. These small structural changes indicate that the decrease of $T_C$ is caused neither by a decrease of the superexchange interactions nor an increased formal oxidation state of Ru.